Azimuthal anisotropy of electrons in Au+Au collisions at $\sqrt{s_{NN}}$=200GeV/c measured with PHENIX at RHIC

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Motivation

Run1 & 2 electron analysis

-> Electrons and positrons at transverse momenta above 1.0 GeV/c allows to study the production of heavy flavor quark-anti quark.

-> The azimuthal anisotropy of high p_t electrons can carry information about the anisotropy of the parent charmed mesons.

The observation of charm flow would indicate that collective motion develops already in the partonic phase of the collision.

- Compare with e v_2 with simple model which is assumed charmed e v2 = 0
- Estimate charmed e v_2 and compare with model prediction which is based coalescence model .

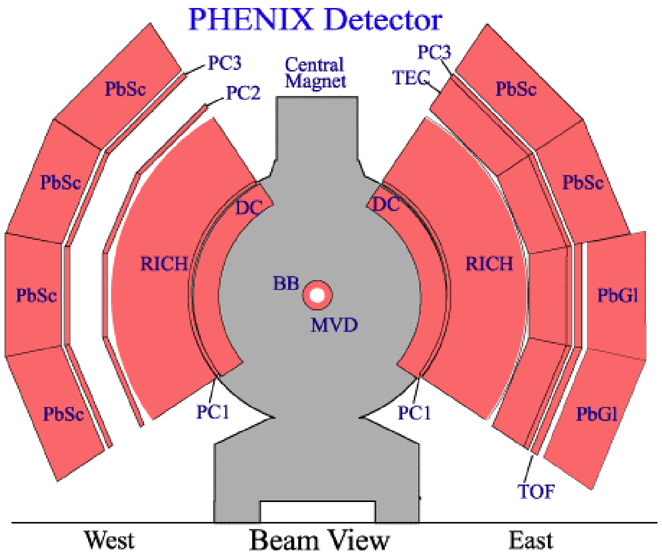
Overview of PHENIX

•In the PHENIX experiment electrons are identified as Cherenkov light by RICH.

RICH
- CO_2
- $0.2 < p_t < 5.0$

  (this analysis $0.4 < p_t < 4.0$)
- $|y| \leq 0.35$

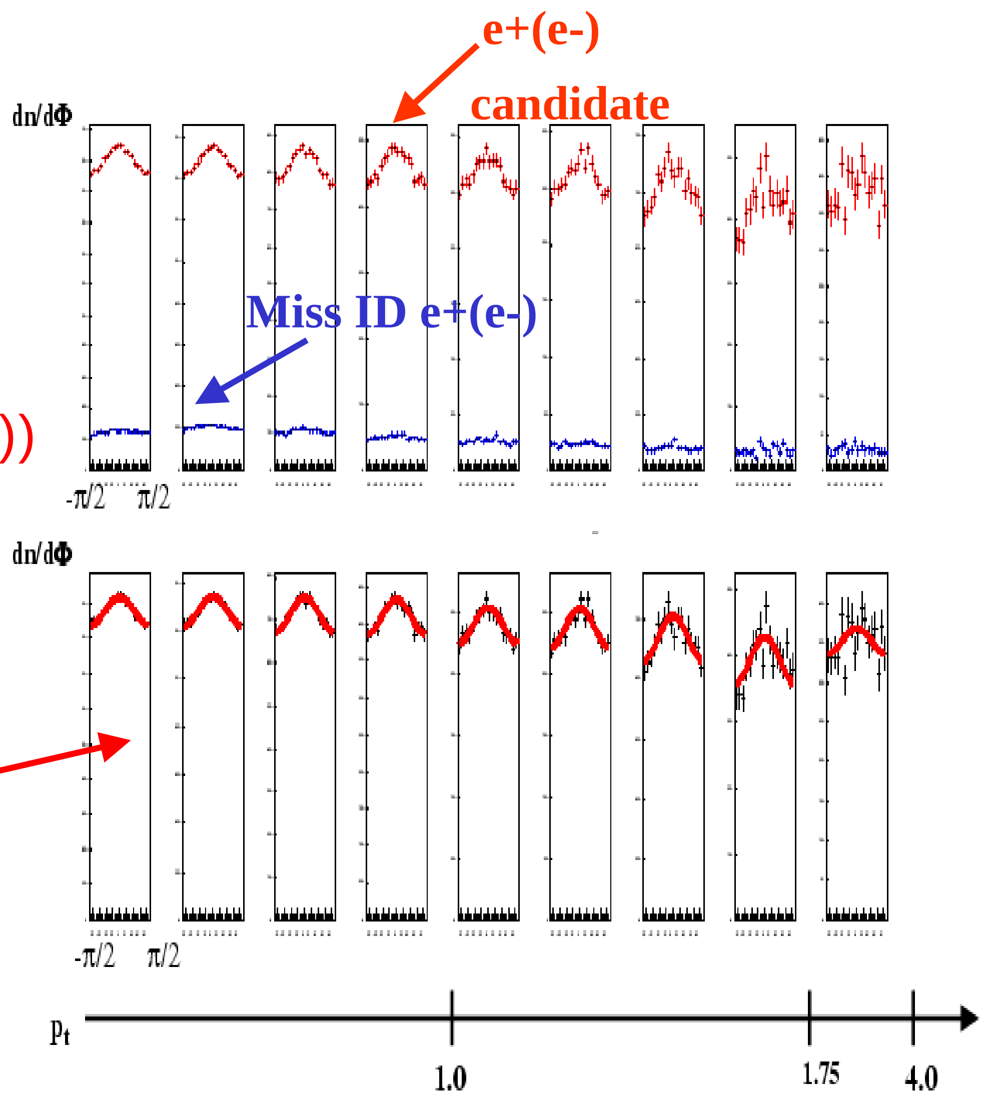
•Reaction plane is determined by BBC



dn/dΦ of e distribution

Electron v_2 is estimated by using reaction plane method. (measure azimuthal angle of each electrons with respect to the reaction plane)

$$dn/d\Phi = N(1+2v_2\cos(2*(\phi-\Phi_{rp})))$$



The bottom distribution is result which is subtracted miss ID electron.

P_t dependence of e v_2

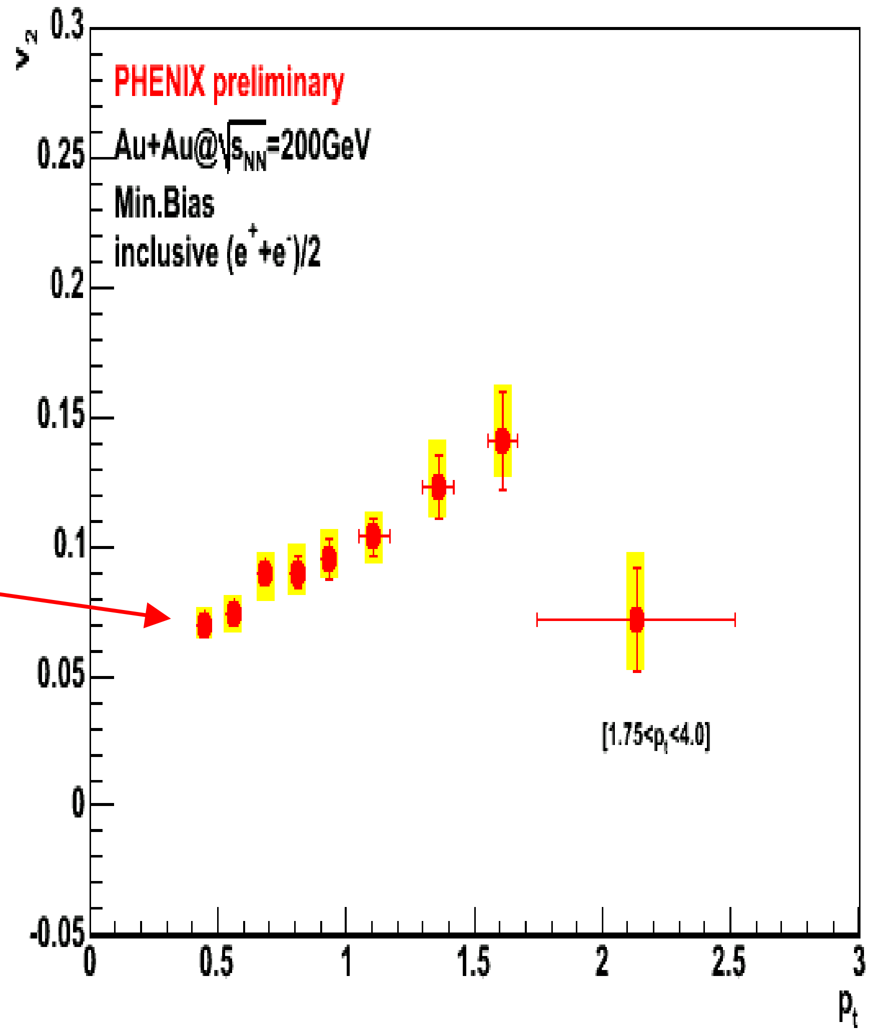
Fig. shows p_t dependence electron v_2. The electrons v_2 are including "photonic" & "non-photonic" electrons v_2.

Dalitz decays
Di-electron decays
Photon conversions
Kaon decays
Thermal dileptons

} "photonic"

charm decay
beauty decay

} "non-photonic"



Comparison with v_2 of hadrons

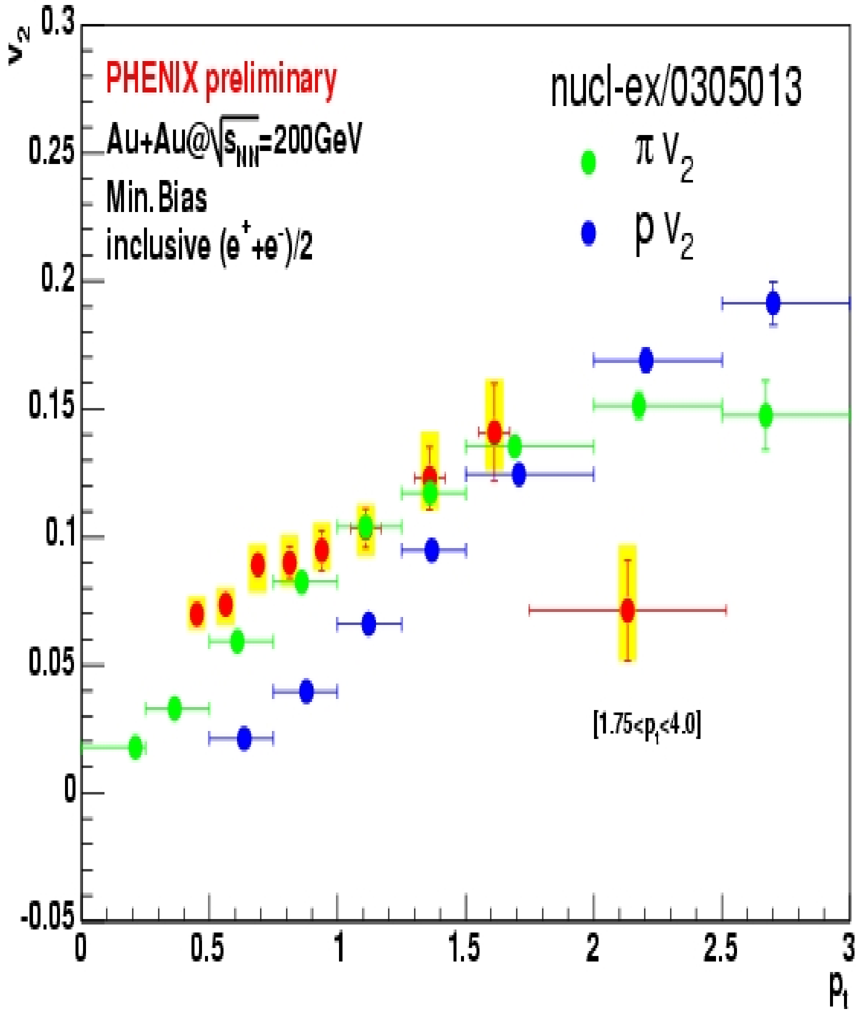
Fig. shows the comparison electron v_2 and hadron v_2 (pion,proton).

@Low p_t (p_t<1.0GeV/c)

$v_{2(e)}$ is larger than $v_{2(pion)}$& $v_{2\ (proton)}$

@high p_t region

This region particular interest because of the contributions from heavy-quark (c/b) decays is large.!



Non-photonic electron v_2

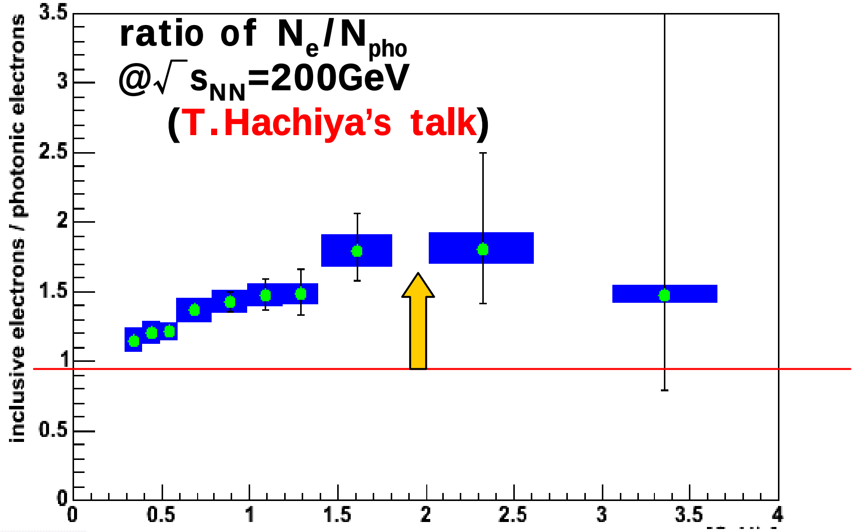
The azimuthal distribution of electron gives as;

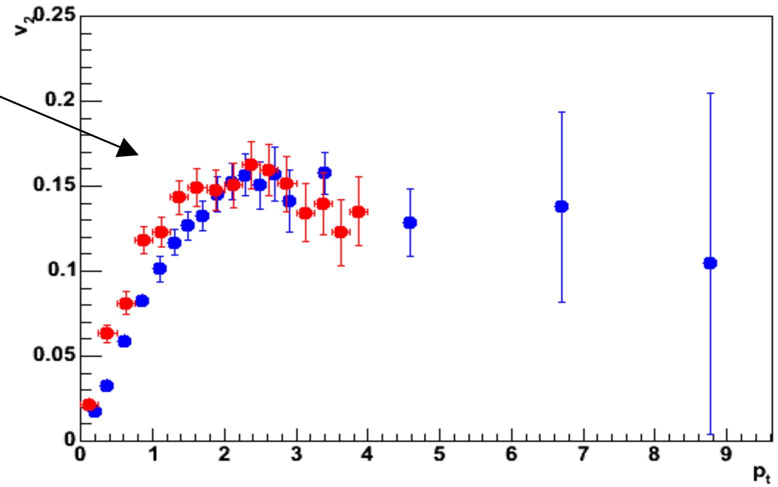
$$dn^{e}/d\Phi = dn^{pho.}/d\Phi + dn^{non\text{-}pho.}/d\Phi$$

From the Eq. electron v_2 is given as;

$$v_{2(e)} = rv_{2(pho.)} + (1-r)v_{2(non\text{-}pho.)}.$$

Here r is ratio of $N_e/N_{pho.}$(shown right plot) and $v_{2(pho.)}$ is photonic electron v_2.





electron v_2 (simulation)
from pi0 (PHENIX preliminary)

(1) e v_2 compare with simple model

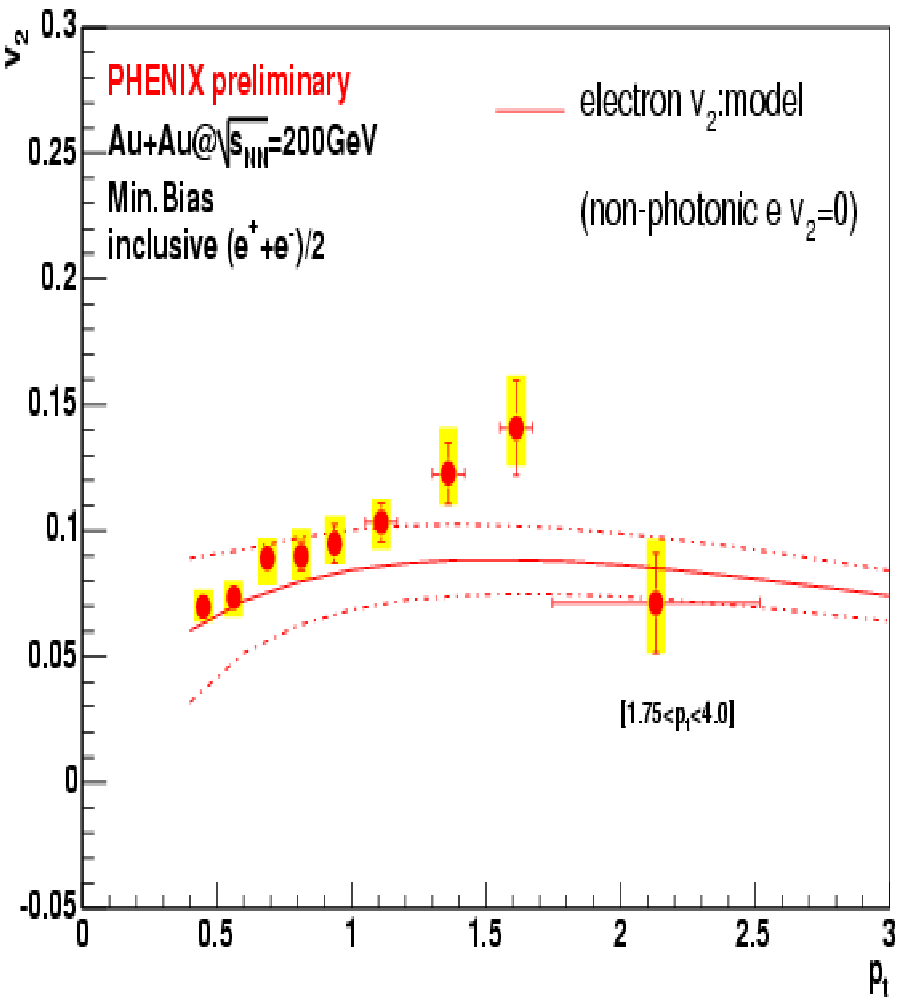


Fig. shows the comparison electron v_2 and model v_2 (electron v_2 assuming non-photonic e v_2=0). From the previous Eq. the v_2 is estimated as;

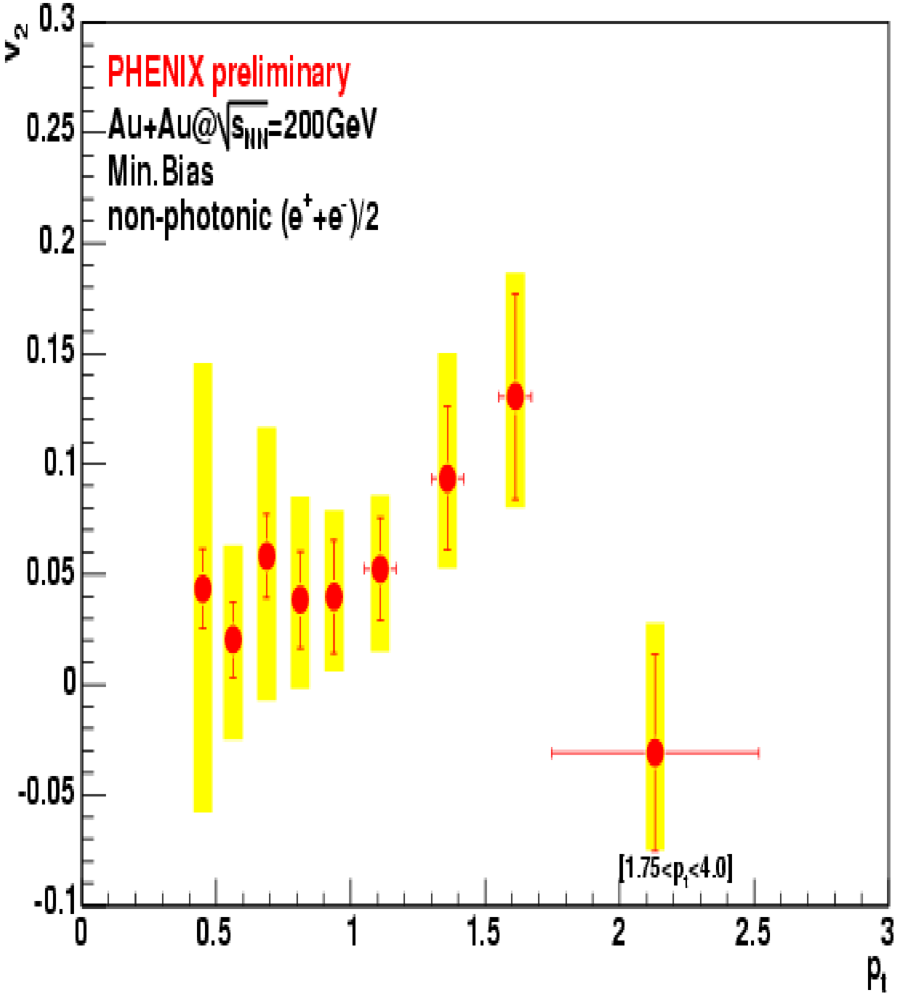
$$v_2 = r v_{2(pho.)}$$

The dashed line means systematic error of the model.

(2) non-photonic e v_2

Fig. shows non-photonic electron v_2 which is obtained by subtracting photonic electron v_2 from electron v_2.

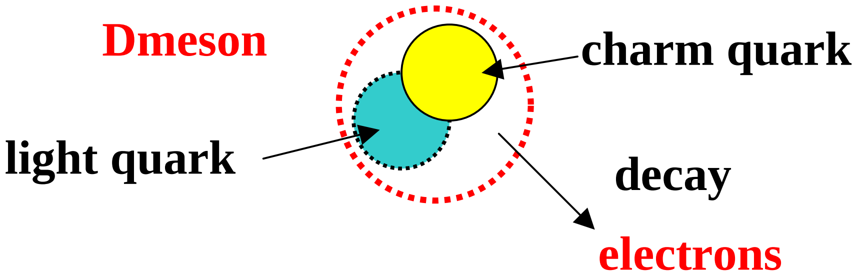
$$v_{2(\text{non-pho.})} = \{v_{2(e)} - r v_{2(\text{pho.})}\}/(1-r)$$



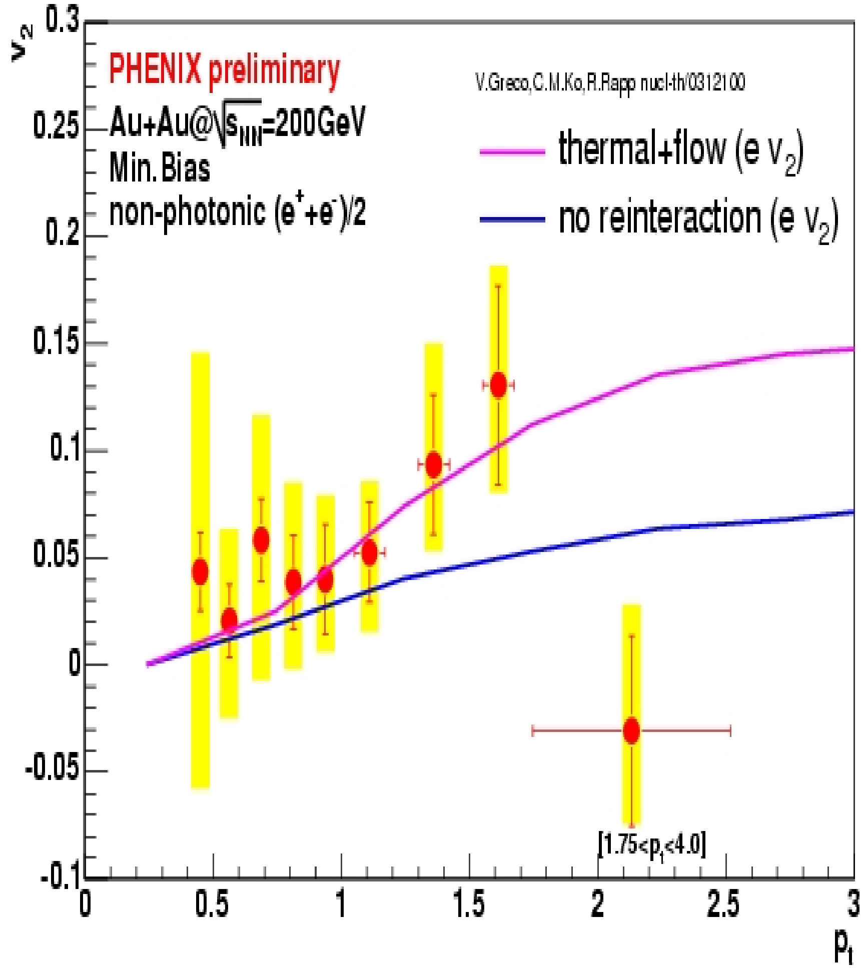
(3) non-photonic e v_2 compare with model

Prediction of charmed electron v_2 which is based quark coalescence model .

$$v_{2(D)} \approx v_{2(light)} + v_{2(charm)}$$



The observed v_2 of electrons from charm decays is consistent within errors with model calculations which assume extremely different scenarios



much more statistics (error bars will be much smaller) @ Run4

Summary

- Inclusive electron v_2 is measured by using the reaction plane method @ 200GeV Au+Au collision.

- "charmed electron" v_2 is determined by subtracting the "photonic electron" v_2 from the inclusive data.

-compared the inclusive electron v_2 with a simple model assuming that the charm v_2 is zero.

-compare with model calculations which assume extremely different scenarios, no reinteraction of the initially produced charm quarks or complete thermalization with the bulk matter.

The model is consistent with the data within error bars.

- much more statistics (error bars will be much smaller) @ Run4